

A NEW GENUS AND THREE NEW SPECIES OF CECIDOMYIIDAE (DIPTERA) FROM *OLEARIA* SPP. (ASTERACEAE) IN AUSTRALIA

by PETER KOLESIK*

Summary

KOLESIK, P. (1996) A new genus and three new species of Cecidomyiidae (Diptera) from *Olearia* spp. (Asteraceae) in Australia. *Trans. R. Soc. S. Aust.* 120(2), 61-67, 31 May, 1996.

A new gall midge genus, *Trigonomyia*, and three new species, *T. unanias* from *Olearia ramulosa* (Labill.) Benth., *T. cristata* and *T. tulipa* both from *O. axillaris* (DC.) F. Muell. ex Benth., are described. Detailed descriptions of the adults, larvae, pupae and galls are given. The species are distinguished from each other by both their morphology and the appearance of their galls. The new genus is diagnosed and placed in the tribe Oligotrophini within the supertribe Lasiopteridi of the subfamily Cecidomyiinae.

KEY WORDS: Cecidomyiidae, *Trigonomyia unanias* sp. nov., *Trigonomyia cristata* sp. nov., *Trigonomyia tulipa* sp. nov., *Olearia ramulosa*, *Olearia axillaris*, South Australia.

Introduction

Three new gall midge species are described here that were found galling flowers of two species of the daisy-bush, *Olearia* Moench (Asteraceae). *Trigonomyia unanias* sp. nov. was found in Black Hill Conservation Park, near Adelaide, infesting the twiggy daisy-bush, *O. ramulosa* (Labill.) Benth. *Trigonomyia cristata* sp. nov. and *T. tulipa* sp. nov. were discovered at Beachport, in the Lower South-East of South Australia, both attacking the coastal daisy-bush, *O. axillaris* (DC.) F. Muell. ex Benth.

Olearia includes some 75 species in Australia and 25 in New Zealand and New Guinea (Cooke 1986). *Olearia ramulosa* is an aromatic shrub, about 1.5 metres high, much-branched, with a woody stem and numerous, small, yellow-white flowers which occurs throughout Australia in mallee, woodland and coastal scrub (Cooke 1986). It is common in Black Hill Conservation Park where it often forms dense localised populations on poor stony soils. *Olearia axillaris* is a 2-3 metres high shrub, morphologically distinguished from *O. ramulosa* by larger leaves and minute ligules. *Olearia axillaris* forms a dense scrub on coastal sand dunes of moderate and temperate Australia (Cooke 1986) and is a dominant plant along the Beachport sea shore.

A new genus is proposed for the three new gall midge species. It is placed in the subfamily Cecidomyiinae and supertribe Lasiopteridi. It is compared to *Rhopalomyia* of the tribe Oligotrophini from which it

is morphologically distinguished by the male genitalia and the larval neck segment. The three new species differ from each other in morphology of the male gonostyli, the ovipositors, the pupal prothoracic spiracles, and the galls.

Material and Methods

Three distinct kinds of flower galls were sampled. One was collected from *O. ramulosa* in Black Hill Conservation Park near Adelaide (17.ix.1994) and two from *O. axillaris* on coastal sand dunes at Beachport (6.x.1994). The two types of galls collected from *O. axillaris* were kept in separate bags and all galls were processed in two ways according to the method previously described (Kolesik 1995). Microscope mounts of the type specimens were prepared by maceration in 20% KOH, followed by processing through distilled water, 70% and 99% ethanol, xylene and were mounted in Canada balsam for examination by phase-contrast and bright-field microscopy. Larvae, pupae and pupal skins were mounted dorso-ventrally. Adults were dissected into four (females) or five (males) pieces and their particular parts mounted separately: wing, head frontally, thorax laterally, female abdomen dorso-ventrally or laterally and male genitalia and abdomen dorso-ventrally. Measurements were made with an eyepiece graticule. Drawings were done with the aid of a camera lucida. The type series and other materials retained in 70% ethanol are deposited in the South Australian Museum, Adelaide [SAM], the Australian National Insect Collection, Canberra [ANIC] and the United States National Museum, Washington DC [USNM]. Adult terminology follows usage in Gagné (1981). Both larval and pupal terminology follows Gagné (1994).

* Department of Horticulture, Viticulture and Oenology University of Adelaide PMB 1 Glen Osmond S. Aust. 5064.

Genus *Trigonomyia* gen. nov.Type species: *Trigonomyia ananas**Adults*

Wings with R_3 joining C at wing apex, R_4 absent, R_1 joining C near wing mid-length, M_3 absent, Cu forked. Maxillary palpus with 3 segments, palpiger well developed. Eye facets rounded, eye bridge 2-4 facets medially. Antenna with variable number of flagellomeres, usually 16-18, first and second only weakly separated. Flagellomeres cylindrical with neck longer in male than in female, with long and stout setae in up to three whorls; circumilar loops short, forming sparse network, similar in both sexes. Empodia longer than claws, pulvilli stout, about half claw length. Claws simple, broadly curved. Abdomen: tergite I sclerotized in both sexes, with posterior setal row only, tergites II - VIII in male and II - VII in female sclerotized, with single posterior setal row interrupted mesally, pair of sparse setal fields laterally and one seta in both anterior corners, female tergite VIII not sclerotized, with triangular field of scattered setae at posterior end; sternites II - VIII in male and II - VII in female sclerotized, with dense, uninterrupted posterior band of setae, scattered setae anteriorly and isolated pair of setae on posterior end. Male genitalia: gonocoxites cylindrical, unlobed, setose and setulose; gonostylus situated caudally on gonocoxite, cylindrical, slightly tapering towards apex, with short apical tooth comprising one claw and several firm bristles, setose, setulose throughout; cerci bilobed, with several stout setae on each lobe, setulose; hypoproct bilobed, with one long seta on each lobe, setulose; parameres divided into two parts, basal lobe simple, asetose, setulose, apical lobe asetulose, bearing 5-6 parallel running lamellae, asetulose, bearing altogether 6-8 large, setose papillae; aedeagus robust, strongly sclerotized ventrally and apically, with apical end triangular. Ovipositor: protrusible; cerci fused into single, terminal lamella, triangular in dorso-ventral view, with numerous strong setae, setulose; hypoproct trapezoid in dorso-ventral view, short, bearing 2 setae posteriorly, setulose.

Pupa

Integument of abdominal segments covered by spiculae. Prothorax and abdominal segments I-VIII with spiracles. Antennal horns short, angular. Cephalic pair of papillae with strong, long setae. Frons with one pair of upper frontal weakly sclerotized depressions and one of 2 lower facial papillae on each side with short seta. Abdominal segments I-VII with 1 pair of ventral papillae, 2 pairs of pleural papillae and 3 pairs of dorsal papillae. Abdominal segments VIII and IX with 1 pair of ventral, 2 pairs of pleural papillae and 1 pair of dorsal papillae. All papillae setose.

Larva

Integument completely covered with dense spiculae.

Head: strongly sclerotized, posterolateral apodemes shorter than one fourth of head capsule length, antennae about three times longer than wide at base, conical. Neck segment with 1 pair of setose pleural papillae. Thoracic segments without spatula but with depression where spatula would normally appear, 1 pair of ventral papillae, 2 pairs of lateral papillae, 2 pairs of pleural papillae, 3 pairs of dorsal papillae. Abdominal segments I-VII with two sternal depressions, 1 pair of ventral papillae, 2 pairs of pleural papillae, 3 pairs of dorsal papillae. Abdominal segment VIII with 2 pairs of ventral papillae, 2 pairs of pleural papillae, 1 pair of dorsal papillae. Abdominal segment IX with 4 pairs of terminal papillae. All papillae setose except thoracic lateral ones. Setae long and clearly apparent on all papillae with exception of ventral papillae which are only slightly longer than integumental spiculae.

Etymology

Trigonomyia combines "trigonon", Gk for triangle which refers to the shape of the apical end of aedeagus and "myia", Gk for fly, commonly used as suffix for genera of Cecidomyiidae.

Remarks

Trigonomyia belongs to the tribe Lasiopteridi because it has male parameres and an irregular number of antennal flagellomeres. The new genus belongs to the Oligotrophini and within that tribe to a group of genera that includes *Rhopalomyia*, and for which the tribal name Oligotrophini (in the strict sense, not including Dasineurini), is available. These genera share the following derived characters: reduction of the palpus to three or fewer segments, relatively short parameres that do not clasp the aedeagus along its full length, larvae each living in a separate cell in galls with pupation occurring inside the larval cell. Other, probably primitive characters shared by all members of *Rhopalomyia* and relatives are the completely setulose male gonostylus and the never divided female eighth abdominal tergite, even when the ovipositor is elongate (Gagné *et al.* in press). *Trigonomyia* differs from *Rhopalomyia* in several ways. In *Trigonomyia* the parameres are divided into two distinct lobes, the aedeagus is sclerotized apically and the larva has setose collar papillae. None of these characters has been noted in *Rhopalomyia* or related genera, although presumably separately derived, indistinct to distinct divisions can be found in the parameres in *Dasineura* (s.l.), *Lasioptera* and *Ledomyia* (Gagné 1994).

Trigonomyia ananas sp. nov.
(FIGS 1, 2, 5-8, 11-17, 19, 21, 22)

Holotype: ♂, Black Hill Conservation Park, South

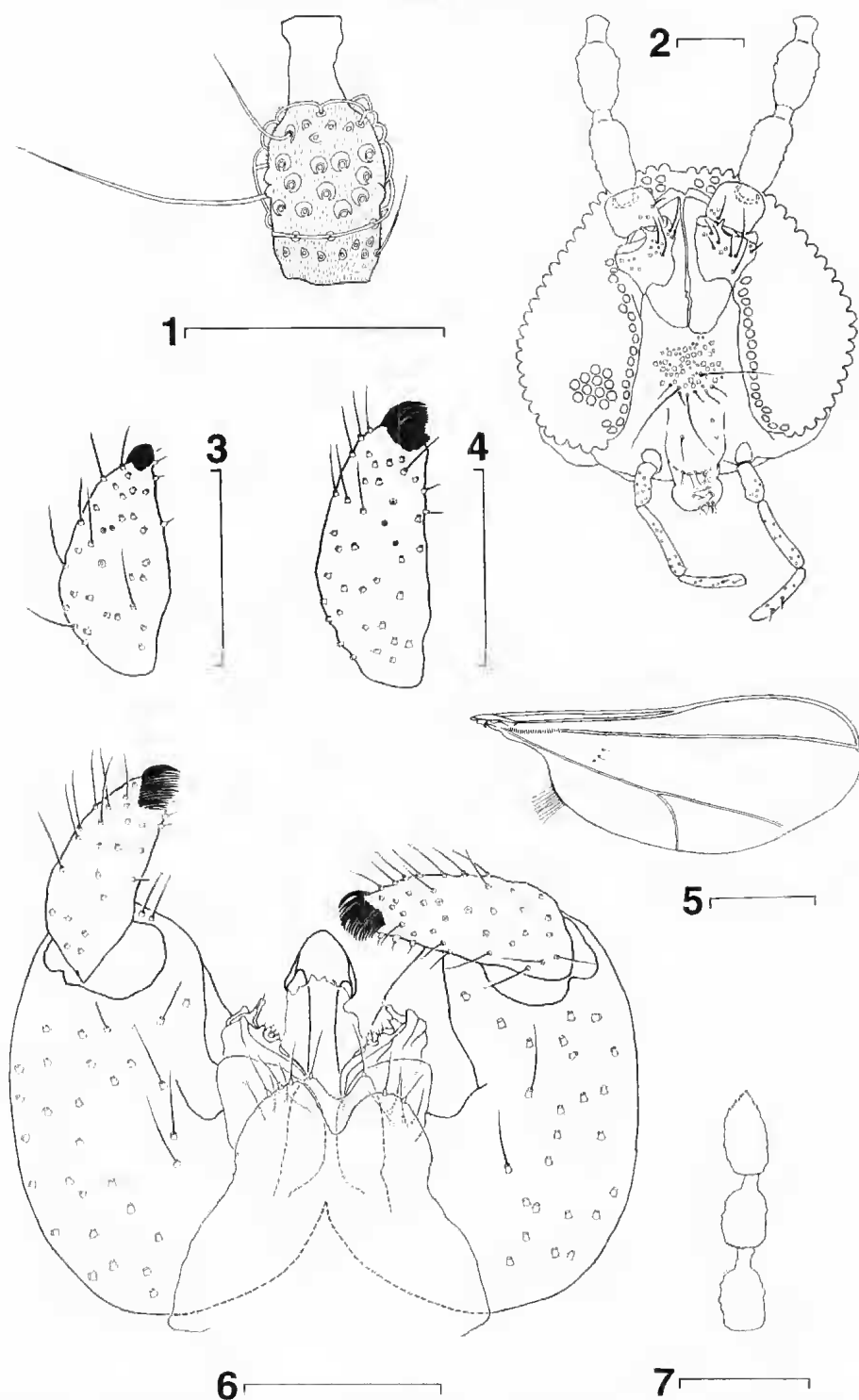


Fig. 1. Sixth flagellomere of male *Trigonomyia ananas* sp. nov. Fig. 2. Head of male *Trigonomyia ananas* sp. nov. in frontal view. Fig. 3. Gonostylus of male *Trigonomyia tulipa* sp. nov. in dorsal view. Fig. 4. Gonostylus of male *Trigonomyia cristata* sp. nov. in dorsal view. Fig. 5. Wing of male *Trigonomyia ananas* sp. nov. Fig. 6. Genitalia of male *Trigonomyia ananas* sp. nov. in dorsal view. Fig. 7. Last three flagellomeres of male *Trigonomyia ananas* sp. nov. Scale bars = 100 μ m 1-4, 6, 7; 1 mm 5.

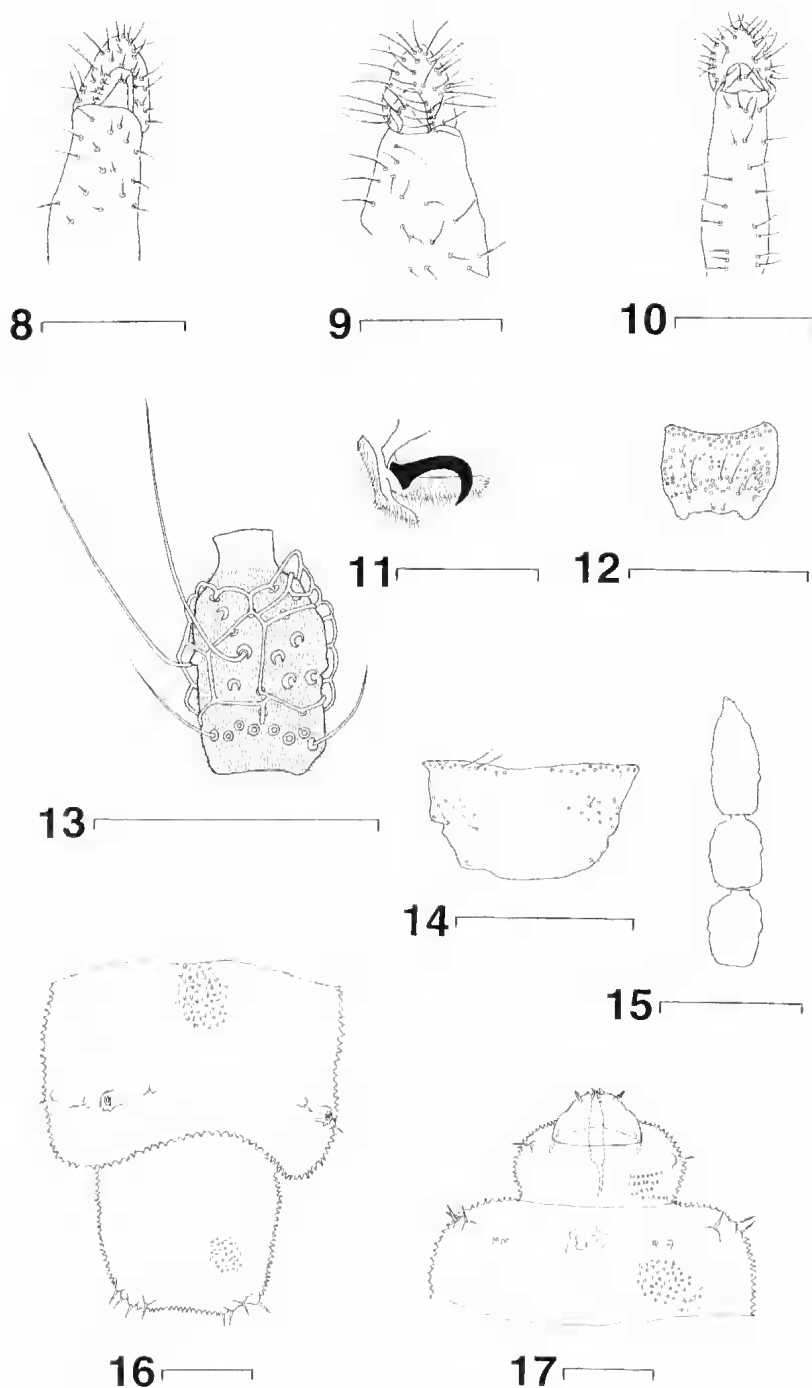


Fig. 8. End of ovipositor of female *Trigonomyia ananas* sp. nov. in ventral view. Fig. 9. End of ovipositor of female *Trigonomyia cristata* sp. nov. in ventral view. Fig. 10. End of ovipositor of female *Trigonomyia tulipa* sp. nov. in ventral view. Fig. 11. End of last tarsomere with claw, empodium and pulvillus of female *Trigonomyia ananas* sp. nov. in lateral view. Fig. 12. Sixth sternite of female *Trigonomyia ananas* sp. nov. Fig. 13. Sixth flagellomere of female *Trigonomyia ananas* sp. nov. Fig. 14. Fifth tergite of female *Trigonomyia ananas* sp. nov. Fig. 15. Last three flagellomeres of female *Trigonomyia ananas* sp. nov. Fig. 16. Last two abdominal segments of larva of *Trigonomyia ananas* sp. nov. in dorsal view. Fig. 17. Head and first two thoracic segments of larva of *Trigonomyia ananas* sp. nov. in ventral view. Scale bars = 100 μ m 8-10, 13, 15-17; 50 μ m 11; 500 μ m 12, 14.

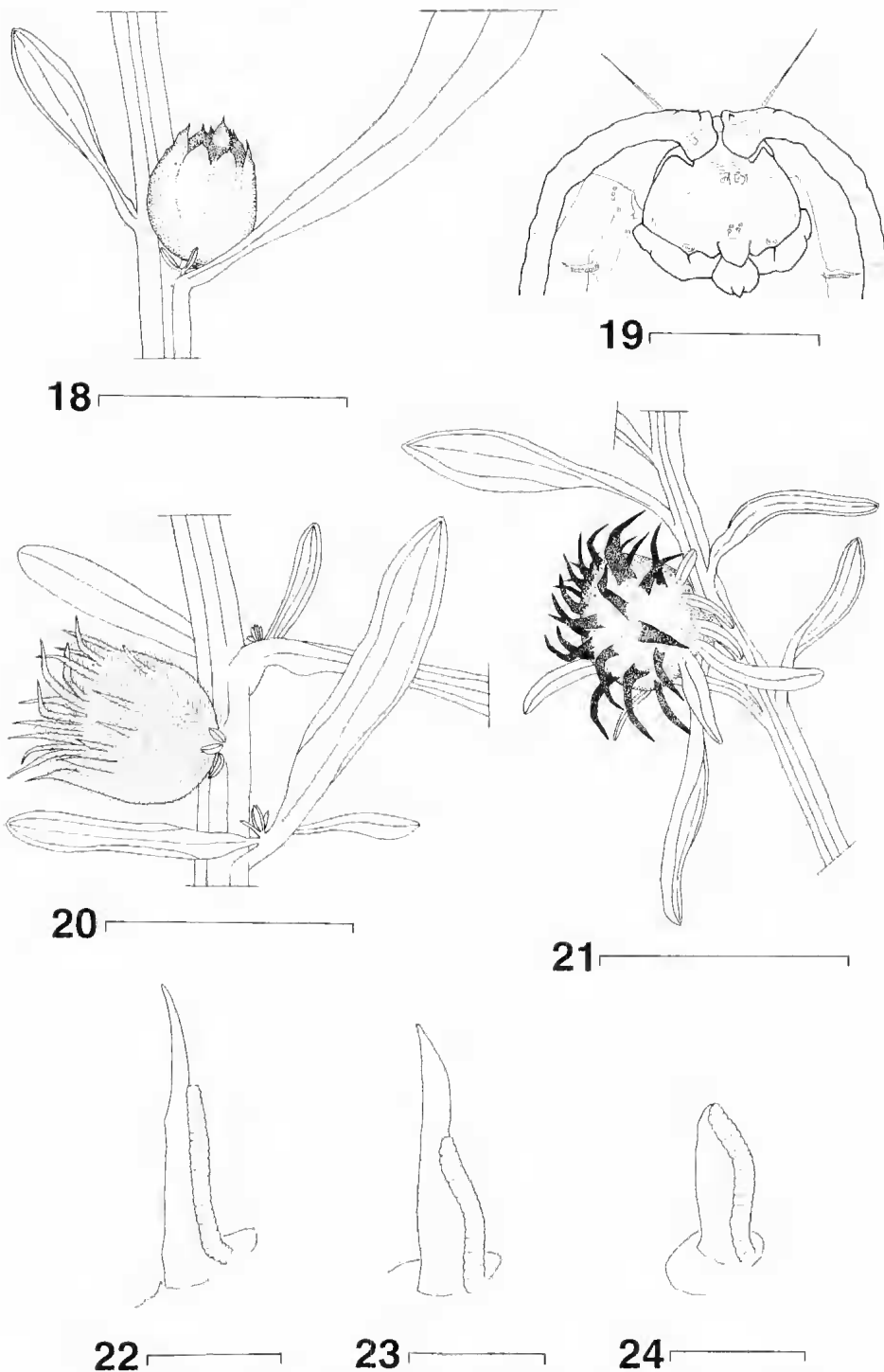


Fig. 18. *Trigonomyia tulipa* sp. nov. - flower gall on *Olearia axillaris*. Fig. 19. Frons of pupa of *Trigonomyia ananas* sp. nov. Fig. 20. *Trigonomyia cristata* sp. nov. - flower gall on *Olearia axillaris*. Fig. 21. *Trigonomyia ananas* sp. nov. - flower gall on *Olearia ramulosa*. Fig. 22. Prothoracic spiracle of pupa of *Trigonomyia ananas* sp. nov. Fig. 23. Prothoracic spiracle of pupa of *Trigonomyia cristata* sp. nov. Fig. 24. Prothoracic spiracle of pupa of *Trigonomyia tulipa* sp. nov. Scale bars = 10 mm 18, 20, 21; 500 μm 19; 50 μm 22-24.

Australia [34°54'S, 138°44'E], 20.ix.1994, P. Kolesik, reared from flower gall of *Olearia ramulosa* (Labill.) Benth., sampled 17.ix.1994, 121294 [SAM].

Allotype: ♀, same data, 121295 [SAM].

Paratypes (all sampled with holotype): 1♂ [SAM], 1♂ [ANIC], 2♀ [SAM], 2♀ [ANIC], 2 pupal skins [SAM], 2 pupal skins [ANIC], emerged 20.ix-8.x.1994; 2 larvae [SAM], 1 larva [ANIC].

Other material (all sampled with holotype): 3♀ [USNM], 4 pupae [SAM], 3 pupae [USNM], emerged 5-8.x.1994; 4 larvae [SAM], 3 larvae [USNM].

Description

Male (Figs 1-2, 5-7)

Colour: antennae grey, head black, thorax brown, abdomen with sclerotized parts black and non-sclerotized red (same in other two species). Wing length 3.1 mm (2.9-3.2), width 1.1 mm (1.1-1.2). Antenna total length 1.5 mm (1.5-1.6). Gonostylus 124 µm (121-127) long, 45 µm (43-49) wide, length of apical claw of gonostylus 17 µm (16-18).

Female (Figs 8, 11-15)

Colour as in male. Wing length 3.0 mm (2.9-3.1), width 1.1 mm (1.0-1.1). Antenna total length 1.4 mm (1.3-1.5). Cercus 65 µm (60-68) long, 57 µm (57-58) wide, setae 5-28 µm long.

Larva (Figs 16, 17)

Colour red (same in other two species). Total length 3.0 mm (2.7-3.6). Head capsule: length 57 µm (50-62), width 95 µm (92-101), posterolateral apodemes 13 µm (11-16) long; antenna 17 µm long, 6 µm wide at base. Length of setae: 2-3 µm in ventral papillae of thorax and abdomen I-VII, 10-20 µm in remaining papillae. Integumental spiculae 1-2 µm long.

Pupa (Figs 19, 22)

Colour: non-sclerotized parts of abdomen red, remaining parts dark-brown (same in other two species). Total length 3.3 mm (2.3-3.9). Length of setae on cephalic papillae 361 µm (354-369). Prothoracic spiracle 98 µm (93-103) long, trachea 70 µm (60-75) long.

Gall (Fig. 21)

Flower bud transformed into spherical, thin walled, monothalamous rosette, 4-6 mm in diameter. When fresh, gall wall green, malformed ligules violet. One larva inside each gall. Pupation takes place within gall. In the area surveyed, most shrubs were infested with up to 200 galls per plant.

Etymology

The word "ananas", a noun in apposition, is the generic name of pineapple and refers to the resemblance of the gall to a pineapple.

Trigonomyia cristata sp. nov. (FIGS 4, 9, 20, 23)

Holotype: ♂, Beachport, South Australia [37°29'S, 140°00'E], 8.x.1994, P. Kolesik, reared from flower gall of *Olearia axillaris* (DC.) F. Muell. ex Benth., sampled 6.x.1994, 121296 [SAM].

Allotype: ♀, same data, 121297 [SAM].

Paratypes (all sampled with holotype): 1♂ [SAM], 1♂ [ANIC], 2♀ [SAM], 2♀ [ANIC], 3 pupal skins [SAM], 2 pupal skins [ANIC], emerged 8-19.x.1994; 1 larva [SAM].

Other material (all sampled with holotype): 2♀ [USNM], 3 pupae [USNM], emerged 8-19.x.1994; 1 larva [SAM], 3 larvae [USNM].

Description

Male (Fig. 4)

Wing length 3.4 mm (3.4-3.5), width 1.3 mm (1.3-1.4). Antenna total length 1.7 mm (1.7-1.8). Gonostylus 150 µm (145-157) long, 55 µm (50-58) wide, length of apical claw of gonostylus 20 µm (19-22).

Female (Fig. 9)

Wing length 3.2 mm (3.1-3.4), width 1.2 mm (1.1-1.2). Antenna total length 1.4 mm (1.3-1.6). Cercus 60 µm (55-63) long, 50 µm (47-52) wide, setae 17-45 µm long.

Larva

Total length 3.0 mm (2.4-3.4). Other measurements within the range of *T. ananas*.

Pupa (Fig. 23)

Total length 3.7 mm (3.1-4.2). Length of setae on cephalic papillae 386 µm (361-427). Prothoracic spiracle 96 µm (86-107) long, trachea 57 µm (51-62) long.

Gall (Fig. 20)

Flower bud transformed into monothalamous, thick-walled gall, 4-8 mm long, 3-6 mm wide, covered entirely with numerous, densely-haired, malformed ligules growing from proximal end. When fresh, both ligules and gall wall green in colour. One larva in each gall. Pupation takes place within gall. At Beachport, *T. cristata* was found with *T. tulipa* on the same shrubs with up to 20 galls of each species per plant.

Etymology

The word "cristata" is L. for tufted, referring to the general appearance of the gall.

Trigonomyia tulipa sp. nov. (FIGS 3, 10, 18, 24)

Holotype: ♂, Beachport, South Australia [37°29'S, 140°00'E], 9.x.1994, P. Kolesik, reared from flower gall of *Olearia axillaris* (DC.) F. Muell. ex Benth., sampled 6.x.1994, 121298 [SAM].

Allotype: ♀, same data, I21299 [SAM].

Paratypes (all sampled with holotype): 2 ♂♂ [SAM], 1 ♂ [ANIC], 2 ♀♀ [SAM], 2 ♀♀ [ANIC], 3 pupal skins [SAM], 2 pupal skins [ANIC], emerged 9-17.x.1994; 2 pupae [SAM], 2 pupae [ANIC]; 3 larvae [SAM], 2 larvae [ANIC].

Other material (all sampled with holotype): 1 ♀ [USNM], 4 pupal skins [SAM], 3 pupal skins [USNM], 1 pupa [SAM], 3 pupae [USNM], emerged 9-17.x.1994.

Description

Male (Fig. 3)

Wing length 3.3 mm (3.3-3.4), width 1.3 mm (1.2-1.3). Antenna total length 1.7 mm (1.6-1.8). Gonostylus 121 µm (119-126) long, 50 µm (45-53) wide, length of apical claw of gonostylus 13 µm (12-14).

Female (Fig. 10)

Wing length 2.7 mm (2.4-3.2), width 1.0 mm (0.7-1.1). Antenna total length 1.3 mm (1.1-1.5). Cercus 56 µm (52-61) long, 50 µm (43-55) wide, setae 6-20 µm long.

Larva

Total length of the only specimen 2.7 mm. Other measurements within the range of *T. ananas*.

Pupa (Fig. 24)

Total length 3.2 mm (2.8-3.4). Length of setae on cephalic papillae 395 µm (364-455). Prothoracic spiracle 51 µm (48-53) long, trachea same length.

Gall (Fig. 18)

Flower bud transformed into smooth, monothalamous, thin-walled gall, 4-6 mm in length, 3-4 mm in width, with tips of malformed ligules sticking out at distal end. When fresh, colour purple. One larva inside each gall. Pupation takes place within gall.

Erymology

The word "tulipa", a noun in apposition, is the generic name of tulip and refers to the resemblance of the gall to a tulip.

Key to species of *Trigonomyia*

1. Trachea reaching end of thoracic spiracle in pupa (Fig. 24). Apical claw of gonostylus diminutive, 1/4 of gonostylus width (Fig. 3). From untufted galls of *Olearia axillaris* (Fig. 18) *T. tulipa*
Trachea never reaching end of thoracic spiracle in pupa (Figs 22, 23). Apical claw of gonostylus large, more than 1/3 of gonostylus width (Figs 4, 6). From tufted galls of *Olearia* spp. (Figs 20, 21) 2
2. Longest setae on female cercus shorter than 2/3 of cercus width (Fig. 8). From pineapple-shaped, glabrous, thin-walled galls of *Olearia ramulosa* (Fig. 21). *T. ananas*
Longest setae on female cercus longer than 2/3 of cercus width (Fig. 9). From hairy, thick-walled galls of *Olearia axillaris* (Fig. 20) *T. cristata*

Acknowledgments

The Ministry of Environment and Planning South Australia kindly gave permission to collect in the Black Hill Conservation Park. Abid A. Munir State Herbarium of South Australia Adelaide courteously identified the host plant species. I am grateful to John D. Gray Department of Horticulture, Viticulture and Oenology University of Adelaide and Raymond J. Gagné Systematic Entomology Laboratory USDA Washington DC USA for their careful review of the manuscript.

References

- COOKE, D. A. (1986) Family Compositae (Asteraceae) pp. 1423-1486 In Jessop, J. P. and Toelken, H. R. (Eds) "Flora of South Australia, Part III (Polemoniaceae-Compositae)" (South Australian Government Printing Division, Adelaide).
- GAGNÉ, R. J. (1981) Family Cecidomyiidae pp. 257-292 In McAlpine, J. F., Peterson, B. V., Shewell, G. E., Teskey, H. J., Vockeroth, J. R. & Wood, D. M. (Eds) "Manual of Nearctic Diptera I" (Canadian Government Publishing Centre, Quebec).
- _____ (1994) "The Gall Midges of the Neotropical Region" (Cornell University Press, Ithaca, New York).
- _____, SOBRIAN, R. & ISIDORO, N. (In press) A review of the genus *Psectrosema* (Diptera: Cecidomyiidae). Old World pests of tamarix, and description of three new species. *Israel J. Ent.*
- KOLESIK, P. (1995) *Asphondylia dodonaeae*, a new species of Cecidomyiidae (Diptera) damaging leaves and branches of hop-bush, *Dodonaea viscosa* (Sapindaceae) in Australia. *Trans. R. Soc. S. Aust.* 119, 171-176.